

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claims 1-10 (canceled)

11.(currently amended) An echelle structure for use in an optical device comprising:

a grating surface disposed between input and output apertures, the grating surface including a plurality of contiguous reflective ~~facet portions~~ facets selectively disposed in a non-constant period arrangement to define a predetermined narrow-band temporal optical transfer function $H(\nu)$ between the input and output apertures, where ν represents frequency in Hz and $H(\nu)$ represents a complex function having an amplitude $A(\nu)$ and a phase $\theta(\nu)$;

respective facets of at least a pair of contiguous reflective facets, ~~facet portions~~ being unequal in spacing and width dimensions.

12.(currently amended) An optical device for realizing ~~an arbitrary~~ a narrow-band temporal optical transfer function; the device comprising:

entrance and exit apertures each operable to spatially single-mode filter an optical field incident thereon over a prescribed wavelength range of operation;

an echelle structure disposed between the entrance and exit apertures, the echelle structure having a grating surface including a plurality of contiguous reflective facets ~~facet portions~~ selectively disposed in a non-constant period arrangement, respective facets of at least a pair of contiguous reflective facets ~~facet portions~~ being unequal in spacing, and with dimensions; and

~~a means of collimating~~ optical outputs of the single-mode entrance and exit apertures being collimated such that components of an input beam, ~~resulting from the collimation of the single-mode entrance aperture,~~ is incident upon a facet of the grating surface of the echelle structure at a common angle of incidence, and components of an output beam reflected by the grating surface toward the single-mode exit aperture being directed at a common angle relative to a facet of the grating surface.

13.(currently amended) A method of fabricating an echelle structure having a grating surface including a plurality of reflective facets ~~facet portions~~ selectively disposed in a non-constant period arrangement, respective facets of at least a pair of reflective facets ~~facet portions~~ being unequal in spacing and width dimensions, for use in an optical system having input and output apertures; the method comprising the steps of:

a) selecting sampling interval of T seconds, where T is not longer than one-half the reciprocal of a frequency range, in Hz, over which a predetermined narrow-band temporal optical transfer function $H(v)$ is uniquely specified, where v represents frequency in Hz and $H(v)$ represents a complex function having an amplitude $A(v)$ and a phase $\theta(v)$;

b) selecting a number M of echelle facets to be illuminated by an input optical beam, based upon the chosen sampling interval T and a minimum resolvable spectral feature W, in Hz, present in either the amplitude $A(v)$ or the phase $\theta(v)$, where $M \geq \frac{1}{WT}$ rounded up to the nearest integer;

c) specifying a frequency v_c , in Hz, about which a characteristic curve for $H(v)$ is approximately centered;

d) determining a vector \vec{h} of complex impulse response coefficients, each

defined by,
$$h_m = \int_{v_c - \frac{1}{2T}}^{v_c + \frac{1}{2T}} H(v) e^{j2\pi v m T} dv$$
, having an amplitude a_m and a phase ϕ_m , where j

$= \sqrt{-1}$ is the imaginary unit, where m represents a counting index for the complex impulse response coefficients and $0 \leq m \leq M - 1$;

e) normalizing the complex impulse response coefficient amplitudes, a_m by multiplying each by a common factor K, such that $\sum_{m=0}^{M-1} K \cdot a_m = 1$;

- f) starting at one edge of the input beam, at $x = 0$, selecting a transverse width w_0 of a first illuminated facet, corresponding to $m = 0$, such that the fraction of the input beam energy reflected by one said facet corresponds precisely to Ka_0 , whereupon said facet is located in a transverse position between $x = 0$ and $x = w_0$;
- g) selecting a transverse width w_1 of the next illuminated facet in the grating surface, corresponding to $m = 1$, such that the fraction of the input beam energy reflected by said next illuminated facet corresponds precisely to Ka_1 , whereupon said next illuminated facet is located in a transverse position between $x = w_0$ and $x = w_0 + w_1$;
- h) iterating step g) M-2 times, to find respective transverse widths and transverse positions for the remaining M-2 illuminated facets;
- i) setting the precise longitudinal position, along the direction of propagation of the input beam, of the center of the m'th illuminated facet, such that a relative delay, compared to a predetermined time reference, experienced by an optical ray incident upon said illuminated facet and collected at the exit aperture is defined by $\Delta t_m = mT + \varphi_m / (2\pi\nu c)$.

14.(currently amended) The method of fabricating the echelle structure recited in claim 13, wherein the input and output beams are collimated.

15.(previously presented) The echelle structure recited in claim 11 wherein said structure is replicated from a master.

16.(previously presented) The echelle structure recited in claim 11 wherein each said facet being illuminated is coated for increased reflectivity.

17.(currently amended) The method recited in claim 14 wherein a single-mode optical fiber provides at least one of said entrance and exit apertures ~~comprises a single-mode optical fiber~~.

18.(canceled)